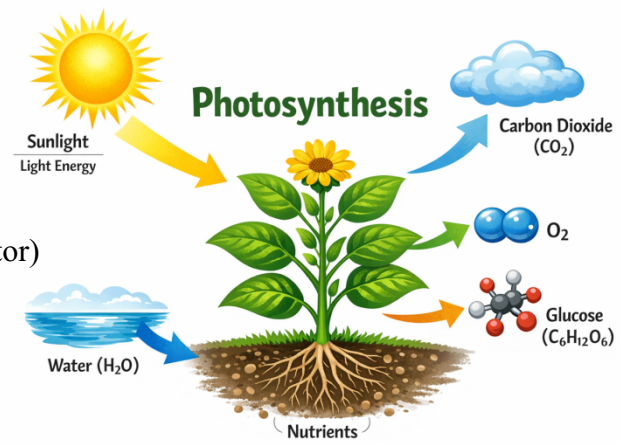
Chapter 5: Photosynthesis & Cellular Respiration

Reactions

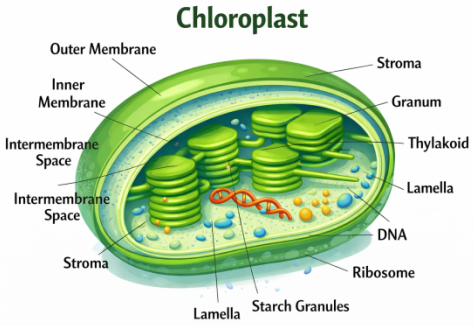
Light reactions

- Light dependent
- Occurs in grana
- Light is the limiting factor (controlling factor)



Dark reactions

- Light independent or Calvin cycle
- Occurs in stroma
- Temperature and CO_2 concentration are the limiting factors

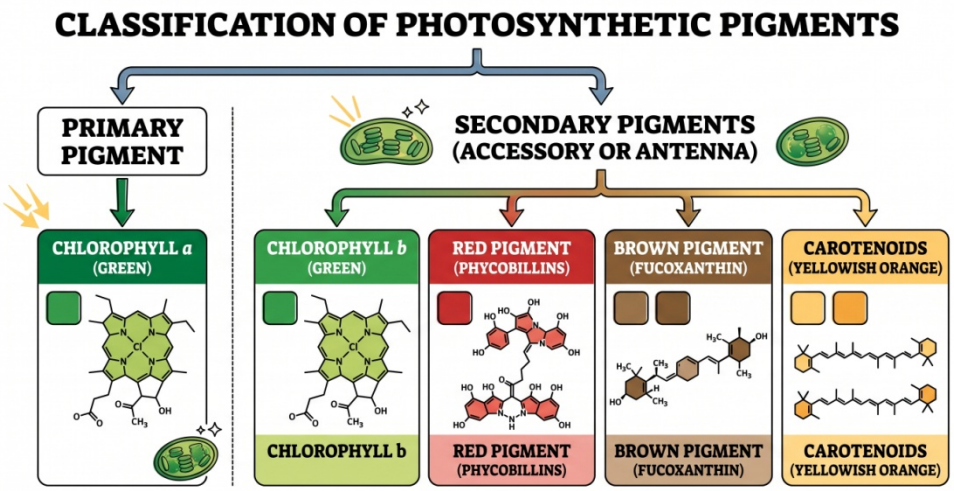


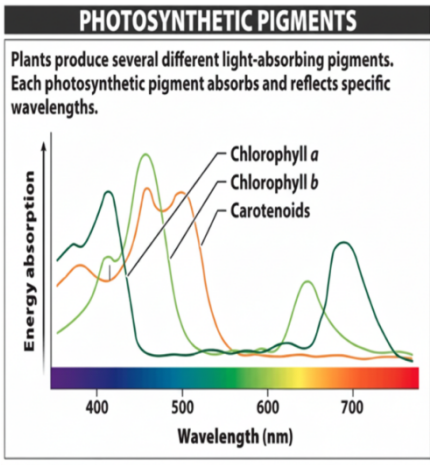
Note:

- The source of H_2 in the sugar is the water molecule
- The source of O_2 in the sugar is the CO_2

Equation of photosynthesis

- $6CO_2 + 6H_2O$ –light Energy→ $C_6H_{12}O_6 + 6O_2$
- REACTANTS (consumed) PRODUCTS





- **Least absorbed colour Green and Yellow**
- **Most absorbed colour Blue and Violet**

Light reactions

- Light dependent
- Occurs in grana
- Light is the limiting factor(controlling) factor)

light → Chlorophyll a → activated chlorophyll a → photolysis(hydrolysis)

- $H_2O \rightarrow 2H + ½ O_2$
  - $2H \rightarrow NADP^+ \rightarrow NADPH$
  - $ADP + P + E \rightarrow ATP$

Dark reactions RUBISCO ENZYME

- Light independent or Calvin cycle
- Occurs in stroma
- Temperature and CO_2 concentration are the limiting factors

$CO_2 + NADPH + ATP$ → (carbon fixation) → G3P → Sugar (PGAL)+ $NADP^+$ + ADP

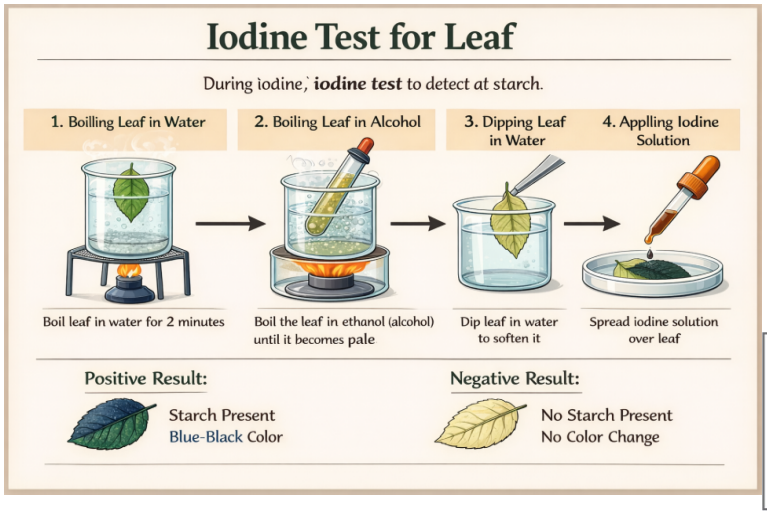
- Burnt by O_2 (Cellular resp.)
- converted into other compound
- Stored as starch

Note: the source of H_2 in the sugar is the water molecule while the source of O_2 in the sugar is the CO_2

Additional notes

- Iodine is used for testing for the presence of starch (Yellowish Brown → Blue)
- As the rate of photosynthesis increases, the rate of production of starch increases, so the blue color becomes darker
- Both reactions occur only when there is light

The final product of photosynthesis & initial reactant of respiration → $C_6H_{12}O_6$


Iodine Test for Leaf
During iodine, iodine test to detect at starch.
1. Boiling Leaf in Water
2. Boiling Leaf in Alcohol
3. Dipping Leaf in Water
4. Appling Iodine Solution
Boil leaf in water for 2 minutes
Boil the leaf in ethanol (alcohol) until it becomes pale
Dip leaf in water to soften it
Spread iodine solution over leaf
Positive Result:
Starch Present
Blue-Black Color
Negative Result:
No Starch Present
No Color Change